THE WATERWAYS AND COMMERCIAL EVOLUTION

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I. During the forty years prior to 1870, the canal barge and river steamer were potent agencies in the promotion of the settlement and industrial occupation of the national domain and in the creation of wealth by making mutually available the interior resources of a virgin continent and the markets of the world. Still earlier in our history, the economic development of the seaboard country of the East and South was made possible by water transportation, and the growth of population and accumulation of wealth were there geographically correlated with natural harbors and navigable rivers over which goods were moved in domestic exchange and admitted to the channels of foreign trade.

With few exceptions, the great American cities of today owe their relative superiority to natural advantages of location with respect to navigation or to tactical initiative in the construction and use of artificial waterways.

No argument is needed to demonstrate the benevolence of nature toward pioneer industry and commerce in the provision of inland waterways on the continent of North America. Over one hundred streams were adequately navigable to the primitive commerce of the Atlantic slope, and the power development at their fall points was a gratifying stimulus to manufacturing industries which gradually sprang up to add their products to the cargoes of raw materials from the forest and farm.[1] Not counting the Mississippi, perhaps fifty streams having a navigable mileage of over 5,000, nearly equivalent to that of the Atlantic-bound rivers, afforded natural trade routes for the products of the plantation country bordering the Gulf of Mexico. These river channels, together with the favorably disposed coastal waters of the Atlantic and the Gulf, constituted a free and ready-made highway of essential importance during the initial period of the country's development.

[1] Report of U. S. Commissioner of Corporations on Water Transportation, volume I, p. 44.

The Mississippi and its tributaries extend a fanlike structure of waterways from the Gulf almost to Canada on the north, to the Rockies in the northwest, and to the Appalachian hills on the east. It is to be remembered that these streams, fifty-four in all, were substantially and adequately navigable for nearly 14,000 miles for the purposes of such commerce as resulted from a half-century of rapid settlement and industrial growth in the adjacent country. There is no reason to discredit a favorable appraisal of the inland waterways in the days when the greatest American opportunity was cheap and rich valley soils and a flowing highway to tidewater —a fortuitous conjunction of natural resources which for a generation gave virility to the most potent forces of the nation's development.

The Great Lakes, distant only a short portage from the headwaters of the Mississippi and extending their looping shorelines from the center of the continent eastward to the St. Lawrence, unlike the river-ways, have continued to serve the growing needs of commerce with unbroken fidelity. The commercial importance of these inland seas in the past and present is incalculable. That their commercial potentialities surpass those of any commensurate body of water in the world cannot be reasonably disputed.

These three great natural systems of commercial intercourse must have seemed almost ideal to American explorers and early commercial enterprisers. It was the ready service of these waterways that made the industrial conquest of America so easy and so quick. The occupation of Canada must have been quite impossible without the network of lakes and streams permeating almost the entire dominion and more or less closely articulating the Great Lakes with the Atlantic and Hudson's Bay at several points. Pacific coast indentations and the 1,600 miles of navigable rivers made the industrialization of the Northwest possible, and the development of Alaska has been dependent upon river transportation.

II. It was inevitable that the development of a considerable commerce should reveal features of *inadequacy* in the natural waterways. Suggestions for the improvement of navigation facilities and for the "perfection" of the national system of waterways came at an early date. Miles Standish is said to have planned a canal from Cape Cod Bay to Buzzards Bay. It was George Washington who ordered the first survey of the Cape Cod route and thus

launched, over a century ago, the foremost waterway project of the present day—articulation by artificial waterways of the navigable indentations of the Atlantic coast to form a fairly direct and storm-free passage from Boston to Beaufort, North Carolina.[2] This scheme of inter-coastal improvement is now extended to contemplate an Atlantic passage to St. Johns River, and thence across the Florida peninsula to the backwaters of the Gulf. It constitutes one of the three comprehensive schemes of canal construction undertaken by way of "perfecting" the natural waterway system. Considerable public and private money has been expended on this project over a long period of time. Some work has been done on almost every segment of the project, and canals of sorts now occupy the more important reaches along the Atlantic coast, but inadequacy of depth, width, and facilities deprive them of much commercial utility.

Two other canal schemes are so plausibly logical that any intelligent schoolboy may chart their approximate routes on the map: namely: (1) an unbroken channel, or channels, connecting the Great Lakes with the ocean on the east; and (2) the creation of one or more Lakes-to-the-Gulf waterways, via canal and river, from several possible points on Lakes Erie, Michigan, and Superior. Both of these plans have actually been executed upon scales which probably seemed permanently adequate in the days of their inception.

The completion of the Erie barge canal in 1825, economically and practically considered, was doubtless the greatest single achievement in the history of American transportation. A second and less successful route from the Lakes to the Atlantic, via the Welland Canal and the St. Lawrence River, was opened by the Canadians in 1833, and lake navigation was greatly improved by enlarging the Detroit River and the construction of two channels around St. Mary's Falls between Lakes Huron and Superior. Both of the Lakes-to-the-Atlantic routes are now subject to projects of large expansion. The state of New York is just now completing improvements on its barge canal at a cost of $101,000,000. Canada

[2] The Cape Cod Canal has been completed within the year at a cost of $6,000,000. A channel 13 miles in length, 25 feet deep and 100 feet in bottom width brings Boston 66 miles nearer New York by water. Traffic around the cape is said to have averaged 25,000,000 tons and 5,000 passengers annually. Two thousand vessels and 800 lives are said to have been lost off the cape on Nantucket Shoals in 60 years.

is advancing plans for a ship canal via the St. Lawrence of such depth and security as to facilitate movements with one transshipment from lake ports to foreign markets. It is thought by some that the demonstrated superiority of either the Canadian or the New York waterway from the lakes to the sea may finally determine the commercial supremacy of the greater cities of Canada or the United States,[3] and may prove equally important in relation to military and naval strategy.[4]

Four nominal water routes have been opened from the Lakes to the Gulf of Mexico. The ancient canoe route of the voyageurs from Green Bay to the Mississippi, via the Fox and the Wisconsin, is now "improved" by a canal cut through the old portage near the site of Fort Winnebago in Wisconsin. Two canals, which have rendered some commercial service, cross the state of Ohio from Toledo and Cleveland on Lake Erie to Cincinnati and Portsmouth on the Ohio River. A fourth opening to the Gulf was effected by canalization connecting and improving the Chicago and Illinois Rivers, with a branch from Hennepin near the head of the Illinois to Rock Island on the Mississippi. Chicago has recently expended $55,000,000, the immediate consideration of which is a matter of the city's sanitation, but which contributes directly to a deep commercial waterway on the old Illinois and Mississippi route to the Gulf. The chief elements of this project are the improvement of the Mississippi River, the opening and maintenance of navigable depths in its tributaries, and the provision of terminal facilities, in all, sufficient to constitute a canal and river system, including a trunk line with properly functioning feeding and distributing branches having standardized navigable depths.

The Mississippi River highway served the commercial needs of the country in an increasing measure until about 1879. In that year one and one-fourth billion tons of freight moved by water in and out of St. Louis. Traffic on the Missouri and the upper Mississippi had then been declining for a decade. Thereafter, the lower stretches of the stream were gradually abandoned until the tonnage of the packet lines has become a negligible factor in American transportation.

After an epoch-making service in the national development

[3] Quick, Herbert: *American Inland Waterways*, p. 20.

[4] *Ibid*, p. 26.

from 1825 to 1862, the Erie Canal lost prestige to the railways, declined rapidly from 1872 to 1877, and suddenly advanced its traffic to the high mark of seven and a quarter million tons in 1880. Since that time traffic on the Erie has declined to a half-million tons. Whether the effect of the virtual reconstruction of the canal will be the rehabilitation of its old-time relative efficiency as a shipping agency is uncertain.[5]

The shallow channels which were designed to connect, commercially, the Great Lakes and the Mississippi were delayed in their construction beyond the time of their possible usefulness. Being thus still-born in an era of railway ascendency, they have served no higher purpose than to testify to the engineering possibilities of their construction and to exemplify the tendency to obsolescence and inadequacy of means of transportation once thought to be permanently sufficient to the needs of the country.[6] The great river highways, with the exception of the Ohio, reached the summit of their usefulness forty years ago, and, perforce, have given way to the apparently cheaper and more efficient railway.[7] Today scarcely a vestige of their former commercial activities remains.

III. The decline of water transportation and the supercession of the railways are due to a number of phenomena which may be designated under three rather closely related captions.

1. *Inadequacy.* Industrial and commercial development has resulted in transportation needs for which existing and potentially possible waterways afford inadequate service.

[5] The reconstruction of the Erie Canal was undertaken in 1902 with the expectation of recovering the wheat traffic from the Lakes to tide-water. This hope has already vanished. (Hepburn, *Artificial Waterways of the World,* p. 100.)

[6] The opinion of Dr. Moulton in *Railways vs. Waterways*, p. 465, is significant! . . . . "While canals satisfactorily served the needs of an earlier period, their day, like that of the sickle, the hand-loom, and the spinning-jenny, is now forever past. Precisely as the canal supplanted the horse in the carriage of through freight, so in turn has the railway, in the course of industrial progress, come to take the place of the canal in the field of transportation."

[7] "River transportation is usually analogous to that by canal, for comparatively few of our streams are really natural highways of commerce. As a rule they are navigable for the purposes of modern transportation, in name only, rather than in fact. So long as the cost of canalization of a river amounts to forty, sixty, or a hundred thousand dollars a mile it belongs in the same category as a canal." *Ibid,* p. 457.

2. *Obsolescence.* The demonstrated physical and functional superiority of railways, particularly with regard to services highly adapted to certain conditions and classes of traffic, established the reciprocal obsolescence of waterway facilities with the advance of traffic needs.

3. *Unfair competition.* Scientifically uneconomical, but effective methods resorted to by the railways to secure traffic in the handling of which they were not necessarily more efficient than the waterways previously enjoying the business, doubtless hastened the destruction of the packet lines.

These forces of inadequacy, obsolescence, and unfair competition, operating under the rather favorable dynamic environment of frontier conditions, have slowly and effectively backed the once prosperous barge and packet operators and optimistic canal promoters into the bankruptcy court and scraped their business and investments, and have concurrently established in their stead a railway system which, taken as a unit, is more extensive and elastic, and which has doubtless rendered a higher average of service at a lower average of cost.

It is significant that, in their organization and administration, the railways have entrenched themselves behind the natural monopoly of the field which they occupy in certain districts, and their technical superiority in the movement of passengers and particular types of freight; and from this position of vantage have unrelentingly refused to coöperate in a division of the traffic or other complementary service, and have persistently refused to admit the possibility of any scheme of joint operation of railways and waterways which might result in a greater efficiency than that of the railways acting alone.[8]

In order to clarify certain economic aspects of the relations between railways and waterways, and to partially establish premises upon which a public waterway policy may be defined, a brief

[8] Seeming exceptions to this position appear in the attitude of Mr. Hill, of the Great Northern (Chicago Address, Oct. 8, 1908), and Mr. Ripley, of the Santa Fé, (*Atlantic Monthly*, Jan., 1911). They have verbally supported the deep waterway movement and rail and waterway coöperation. Mr. Hill is reported to have said on an earlier occasion, that he "could make railway rates to the Pacific Coast so low that the Panama Canal would grow up to pond lilies; and that, before the Mississippi River could compete for traffic with the railways, its sides and bottom would have to be lathed and plastered."

analysis of the above-mentioned causes of railway ascendency is necessary.

With regard to the inadequacy of water transport, it is commonplace to observe that the wider distribution and intensification of industry, and the centralization of markets normally attending a rapid growth of population in a new country, are reflected in the volume of goods to be moved, and consequently, the primary test of the adequacy of a transportation system is its adaptability to such growing and varied demands, and this in advance of the actual development of the heavier traffic. The apparent inadequacy of the waterways to move the potential products of rapidly developing industries first invited railway construction, not as a competitive or cheaper means of transport, but as a much needed supplementary carrying device.

The degree of obsolescence inherent in means of water transportation is a matter of unfavorable comparative efficiency. When production and marketing become highly specialized, when distributing distances are great, when materials of commerce assume characteristics of complex processes of production, high specific value, and seasonal utilization, when the efficacy of working capital and availability of credit facilities demand rapidity and certainty in all the processes of production, distribution, and marketing, then, speed, safety, and regularity of transit assume relatively greater importance. In other words, service standards are determined by industrial conditions and constituted of celerity, regularity, and security; and the rate is a derivative of the service—being based either on the value of the service or the cost of the service.

Obviously, the waterways are functionally and permanently obsolescent with regard to certain kinds of traffic regardless of what rates they may offer. Having, perforce, surrendered a part of the traffic to supplementary and superior rail facilities, the law of decreasing unit costs operating in the railway business may justify carrying the remainder of the traffic by rail, as secondary traffic, on the rate principle of the *additional cost of the specific service*, thus, characterizing as obsolesent the entire waterway system as a carrying unit. Furthermore, if the decreasing unit cost, under the operation of the law of increasing returns, was justification for a total paralysis of the waterways; conversely, if a state of increasing unit costs, or the operation of the law of decreasing returns, should fall

upon the railway system, a rehabilitation of the waterways might logically be in order, as a supplementary device to relieve the over-stressed railways. There is evidence sufficient to suggest the possibility of such an eventuality.

Superior railway organization and intercorporate relations between great railway, banking, and industrial corporations constitute another element contributing to waterway obsolescence with reference to administrative efficiency, finances, and traffic development.

In the minds of friends of the waterways and many non-partisan students of American transportation, unfair competition is the chief engine of destruction which has been successfully operated by the railway corporations in reducing waterway traffic. The enumeration of certain well-known railway policies in their conduct toward waterways is sufficient to establish the premises if not the conclusion of this thesis.

The deliberate cutting of railway rates below average unit costs, and even below the operating costs of the service, upon certain classes of traffic and within certain districts subject to water competition, the deficit being made up on non-competitive traffic and in non-competitive regions, has been and still is a common practice.

The policy of railways in acquiring ownership of shore lands so located as to constitute necessary and convenient boat terminals has placed many dockage sites essential to waterway development in the control of the railways. Boat lines operating in the lake and coastal trade are now seriously hampered by this dog-in-the-manger policy of the railways.[9]

Purchase of rival canal routes and of essential segments of canal and river lines offering possible competition has enabled railways to throttle water traffic by maintaining prohibitory canal tolls and arbitrarily closing water routes. Like results are said to have been accomplished by the payment of an annual subsidy by the trans-continental railway lines to the Panama Railroad in consideration of the maintenance of a scale of rates across the isthmus on certain forms of ocean-to-ocean traffic sufficient to divert them from the coasting vessels to the all-rail haul.

[9] Moulton, *op. cit.* pp. 82–83. Quick, *op. cit.* 109 *et seq.* Bradford, *The Annals of the American Academy*, Vol. 55, p. 240.

The studied refusal of railways to enter into traffic agreements or to coöperate in any way with independently owned water lines is the most vital and conspicuous form of unfair competition. Railway managers have been particularly careful to avoid any demonstration of the doctrine that rail and water facilities may be so correlated in their functioning as to render an improved or extended service at a decreased joint cost.[10]

What may properly be considered "unfair competition" is a question which might profitably receive scientific definition before final measures are taken in the formulation of waterway policy. There is reason to distinguish clearly between the attributes of private business and public business in the delimitation of *fair* and *unfair* competition. In the opinion of the writer, the application of the "additional cost" basis of rates has been and now is being carried into the field of unfair competition and was so used to divert traffic from the waterways.

IV. During the forty-year decline of boat traffic, many plans have been put forward and many arguments have been advanced looking to the construction and maintenance of an effective system of inland water highways. Domestic ocean transportation is in much the same category as canals and rivers, traffic by water between the Atlantic and Pacific coasts having declined since 1870.

Excepting the construction of the Panama Canal, the policy of waterway development cannot be said to have been seriously and systematically entered upon by the government; nevertheless, congressional appropriations for river and canal works have recognized the political, if not the economic, justification of almost every waterway project which has been advanced. The magnitude and disposition of such appropriations of public funds have long been a spectacle of national prodigality not clearly understood by those unfamiliar with political motives back of "pork barrel" legislation. Granting, for the moment, the beneficence of a policy of waterway development, there is no greater obstacle to its serious promotion than the traditional prostitution of waterway projects to the political pirates who customarily derive their sustenance from the congressional pork barrel.

Federal expenditures on river improvement since 1790 amount

[10] Van Hise, *Conservation of Natural Resources*, p. 170—Commissioner of Corporations, *Op. cit.* Pt. II. p. 257.

to over $300,000,000, composed mainly of the rapidly increased appropriations of the last twenty years.[11] Disregarding river improvements by the states, which have cost considerable, canal and river work in the United States has cost over $600,000,000—more than the total cost of waterways in France and Prussia combined.[12]

Before undertaking a survey of the economic aspects of nationwide waterway improvement, a brief characterization of the more important projects which are receiving vigorous support and most of which seek public aid is in order.

1. The above-mentioned inter-coastal ship passage to extend from Boston to the Gulf of Mexico may be completed at a probable cost of $100,000,000. Certain segments of this passage might be operated independently with reasonable chance of commercial success; however, the rapid construction of the entire project and its operation as a unit seem necessary to develop its highest efficiency as a transportation agency.[13]

2. The much discussed Lakes-to-the-Gulf waterway, via the Chicago drainage canal and the Illinois and the Mississippi rivers, if standardized at the present depth of the Chicago canal (twenty-four feet), would cost about $200,000,000. An eight to fourteen foot depth which is favored by the engineers would cost much less.[14]

[11] Hepburn, p. 136. *Report of Chief of Engineers U. S. Army 1914*, pp. 28 *et seq.*

[12] Moulton, *op. cit.*, p. 68.

[13] In 1913, $500,000 was paid by the federal government for private rights in the old Delaware and Raritan Canal; furthermore, measures looking to the construction of a ship canal 31 miles in length across the state of New Jersey at a possible cost of $15,000,000 seems fairly well advanced.

The purchase of private rights in the Delaware and Chesapeake route and the construction of a 30-foot ship canal at a cost of $17,000,000 have been recommended by the Army engineers.

A channel connecting Chesapeake Bay and Beaufort Inlet, N. C., via Albamarl and Pamlico Sounds, 200 miles in length, would cost $2,500,000, if 12 feet deep, and a ship canal would cost $35,000,000. Private rights have been acquired by the government and the work is under way.

An inter-coastal waterway having a minimum depth of 6 feet now extends a distance of 300 miles along the coast of Georgia and the Carolinas, and canals of like depth reach three-fourths the distance from Jacksonville across Florida towards the Gulf.

[14] In addition to the work done in Illinois, the Mississippi below the mouth of the Ohio is under improvement. $3,750,000 is allotted for 1915. (*Report of Chief of Engineers U. S. Army, 1914*, pp. 919 *et seq.*)

3. The improvement of the Mississippi, as an operating unit, must properly include the rehabilitation of navigation on the upper Mississippi and the Missouri, in addition to the improvement of the Ohio and the lower Mississippi where considerable traffic of a distinctively local character is now moved by water. Improvements on the lower Mississippi would not involve a large initial outlay, but the annual maintenance cost would be heavy.[15] To open the channel from St. Louis to Minneapolis and St. Paul, would cost twenty to fifty million dollars according to depth. To canalize the Ohio from Pittsburgh to Cairo to a depth of nine feet will cost $60,000,000.[16] A twelve foot depth on the Missouri from St. Louis to Sioux City would cost forty to fifty millions and a somewhat shallower channel to Fort Benton would add an equal amount.[17]

The entire Mississippi system project centering upon St. Louis, and extending its navigable trunks to Fort Benton at the head of the Missouri, to the Twin Cities near St. Anthony Falls on the upper stream, to Pittsburgh on the headwaters of the Ohio, to New Orleans at the Delta, and including a ship channel from Chicago to the Gulf, would probably involve an initial outlay of $500,000,000. If the advice of the engineers against the construction of a ship canal be followed, and a barge-channel depth through the valley be substituted, the total cost might be as low as $300,000,000.

[15] Work necessary to be done on the lower Mississippi in the maintenance of navigation will largely depend upon what is done toward the prevention of floods and erosion on the upper reaches of that stream and its tributaries. Flood protection and the development of water power may be correlated with the improvement of navigation and, to a considerable degree, the necessary cost of either may be made a joint expense.

[16] Over $6,000,000 has recently been expended in the improvement of the upper Mississippi; $1,200,000 is allotted from the federal appropriation for 1915.

The canalization of the Ohio from Pittsburgh to its mouth was approved by Congress in 1911 and the work is well advanced. The Ohio is the one river which has shown an appreciable increase in traffic during recent years, due to its unique location with relation to the coal fields.

[17] The engineering problem of reclaiming the Missouri is said to be the most difficult of the entire inland waterway project. A considerable period and high cost of maintenance for a number of years would be required to confine the stream to a permanent channel. The relative usefulness of the Missouri would seem to be commensurate with the higher costs of improvement. For many years during the height of river navigation, the Missouri carried more traffic at St. Louis than moved on the Mississippi both ways from that port.

The engineering problems involved are not particularly difficult, but the maintenance costs during the earlier years, especially on the Missouri, would be large.

4. Although the state of New York has about completed the main work, in the reconstruction of the Erie Canal, and despite the existence of a ship channel of sorts through Canada, via the Welland Canal and the St. Lawrence River, the provision of adequate navigation facilities between the Great Lakes and the Atlantic has not yet matured from project to realization. The terminal facilities and operating efficacy of the New York canal are still largely in *prospect*. In electing to reconstruct the barge canal rather than venture the opening of a ship channel from the Hudson to the Lakes, New York left Canada without competition in the promotion of a ship channel from the Lakes to the Atlantic. Canada has in prospect the improvement of the St. Lawrence route to provide a safe and convenient ship channel to a depth of twenty-five feet. Canada seems also seriously to have undertaken to open an easy passage from Georgian Bay, via French River and Lake Nippissing, to Ottawa, on the Ottawa River, and thence to Montreal, Quebec, and the Atlantic. Canada has also cut the narrow ridge dividing Lake Huron and Lake Ontario, thus creating a direct east and west passage from Lake Superior points to the St. Lawrence and almost a great-circle water route through Canada from Lake Superior and Lake Michigan ports to the markets of Europe.[18]

The foregoing characterization of the rise and decline of the waterways and of measures in project for their rehabilitation is probably trite to many readers. However, the iteration is hazarded as a basis of reasoning, which must be more or less *a priori*, as to the potential commercial and social functions of waterways if projects for their development are consummated. The rôle which waterways once played in the business affairs of the nation is, in this connection, of no great significance; but the motive forces which have placed railways in the ascendency and effected the commercial evacuation of the waterways are matters of interest, particularly as to the likelihood of their perpetuity. In other words, we may wisely inquire whether the facts of inadequacy and obsolescence of water transport and the converse qualities of

[18] Quick, *op. cit.*, Notes c and d, p. 216.

elasticity and efficiency of railway service are technically inherent and continuing, or whether economic development and industrial maturity may make way for a renewed functioning of waterways, either independently of or in physical coöperation with railways.

Summarizing the discussion to this point, we have indicated the very superior natural facilities of North America for coastal and interior water transport, and the adequacy of such waterways, with the aid of inexpensive additions and improvements, to facilitate primitive industry and trade and thereafter to attract a constantly increasing tonnage for many years in active competition with railways. The direct causes of the decline of water-borne traffic are found to reside in facts of industrial evolution and railway development which clearly indicate the physical and functional shortcomings of a system of inland water transportation when operated as an independent transportation unit. Finally, an examination of the more comprehensive projects for the improvement of navigation along lines designed to free the waterways of the commercial palsy of inadequacy and obsolescence justifies the conclusion that the development and maintenance of navigable waterways are physically possible at a relatively low initial cost (less than $1,000,000,000) in comparison with the amount said to be required by the railways (five to ten billion dollars) for necessary extensions and betterments within the next decade.[19]

V. It remains to consider the possible benefits of a thoroughly developed and properly organized system of inland water carriers, and, in so doing, to keep in mind the essential dynamic motive of industrial evolution; namely, that the population of this country is growing at the rate of two per cent a year and that the concurrent growth of the social demand for facilities of commerce is three to five times as rapid.[20] It may also be emphasized that under possible

[19] Hill, New York Address, Dec. 19, 1912. *Railway Business Association Bulletin*, Feb. 23, 1912.

[20] "In the ten years between 1895 and 1905, the railroad mileage of the country had increased but 21 per cent, while the passenger business had grown 95 per cent and the freight business 118 per cent. By the decade ending in 1907 the increase of mileage as compared with 1897 had crept up to 24.7 per cent; but in the same time the increase in passenger business had leaped to 126.1 per cent, and that of freight traffic to 148.7 per cent." (Hill. Chicago Address, 1908.)

conditions waterway development need not be a hostile demonstration toward railways as a whole, but may be so timed and so directed as to afford a complementary transportation service and, in the long run, prove a boon rather than an injury to private interests involved in the railroad business.

The two doctrines most vigorously advocated by partisans of waterway propaganda are quite fallacious, and so obviously so that their proclamation is doing more to impede the progress of a scientific waterway policy than to advance it. I refer (1) to the argument that the maintenance of navigable waterways, even though they carry no traffic, is a justifiable and expeditious means of "regulating" railway rates; and (2) to the unsupported assertion that waterway development would make transportation so easy and so cheap as to materially reduce the present cost of living and stimulate industry by decreasing the cost of materials.

In support of the claim of regulative benefits of water competition upon railway rates, attention is customarily directed to low rates in the South resulting from the existence of used and unused water routes. It is true that through-rates and some local rates are very low in the South under the operation of the basing point system which is an outgrowth of water competition. It is also true that the deficits in service costs in this cheap traffic are made up by excessive railway charges in other districts and serious regional discrimination results. It may confidently be asserted that the least reasonable and satisfactory rate systems and the greatest obstacles to scientific rate control exist in districts where actual or potential water competition has been a factor in railway rate making.

If the conditions of water competition could be made universal, some semblance of logic might support the doctrine of automatic rate control by rail and water competition; but to develop waterways, considering their necessary geographical limitations, in the expectation of lowering rail rates by competition, or even with the intention of permitting unrestrained competition between rail and water carriers, would be industrially and commercially destructive. Adequacy of the transportation system, the quality of the service, and non-discriminatory charges are of much greater economic import than the gross amount of the rates. Furthermore, the idle investment of a billion dollars in order to reduce the earnings of an active investment of $20,000,000,000, in these days of cost ac-

counting and scientific methods of service standardization, approximates mental simplicity—a procedure somewhat analogous to the purchase of a dog to chase one's own chickens out of one's garden —a policy rather destructive to all useful elements concerned, as well as expensive. The reasoning might be different in case the provender seeking fowls belong to a neighbor and the line fence is down.

It is doubtful if any contemplated scheme of transportation development, other than better wagon roads, can materially reduce transportation costs. A reasonable defense of any project resides in its probable effectiveness in providing and maintaining adequate service, a requirement which the railways are not always able to meet, and in maintaining rates at something near the present level, with a minimum of uneconomic discrimination.

The admirable study of Dr. H. G. Moulton[21] leaves no room for intelligent controversy as to the relative unit costs of rail and inland water transportation. The foundation of the popular fallacy of cheap rates by water resides in the fact that some few natural waterways are readily navigable without any considerable expense for improvements, and in such cases fixed costs may be so inconspicuous as to make transportation rates on such traffic as is adapted to the service very low. This is true of lake and ocean transportation on long hauls, and of a very few river and canal routes. Again, a desultory, irregular, and unorganized water service may be afforded at times and places and to certain commodities at rates lower than rail costs. But when sufficient capital is invested to insure reasonably adequate and regular service by river or canal, the experience of the world fails absolutely to support the claim of lower costs of water transportation *if interest on capital invested is included in the cost of the service to be covered by operating revenues.*

Excepting in the Netherlands, the canal and river systems of Europe are considered successful when the earnings are sufficient to compensate operating costs with a possible slight contribution to maintenance. Ordinarily, there is no return at all to the public capital expended in development and maintenance.

In France and Germany, both privately and government owned railways are operated at a profit, allowance being made for interest. The waterways are constructed at public expense and largely main-

[21] Moulton, *op. cit.* p. 455 *et seq.*

tained by taxation. Water rates on certain traffic are attractively lower than rail rates, and in some instances traffic is driven from rail to water routes by legally enforced prohibitive rail rates. In this situation, Dr. Moulton sees only poor economics and mistaken public policy and advocates the evacuation of the waterways. In the opinion of the writer, there is reason to doubt the validity of this conclusion. But Moulton has established beyond peradventure that there is little probability of lower average transportation costs as a result of improved water transportation.

VI. Disregarding the probability or improbability of lower rates, there is evidence of possible beneficence of a progressive waterway policy in the United States, and such evidence bears promise of increasing weight with the flight of time.

First. There are indications of the approaching maturity and inelasticity of the railway system and its consequent failure to meet future demands of commerce unless relieved or deprived of certain classes of traffic which are absorbing a rapidly increasing amount of operating capacity.

Second. Public outlays for permanent improvements are not properly to be considered as being in the same category with private investments, particularly, with respect to expected dividends and the inclusion of *interest* as a cost factor in the calculation of rates to be charged for public services. This being granted, waterway development may be justified in spite of the improbability of commercial revenues sufficient to cover *costs,* including interest.

Third. Sound public policy in flood prevention and water power development may dictate such measures as will make navigation a coördinate, or possibly secondary, object of stream control; thus materially reducing the capital costs of development and maintenance chargeable to any one purpose.

During the autumn and winter of 1906 and 1907, there occurred an unprecedented congestion of railway traffic in the United States which, although partially due to poor operating management, was indicative of possible physical traffic limitations of the railway organism. There have been recurrences of traffic congestion less severe than that of 1907, but of sufficient frequency and magnitude to hamper commerce and to cause considerable anxiety among thoughtful railway managers as to the future performance of the railway system. Traffic congestion does not mean merely an ex-

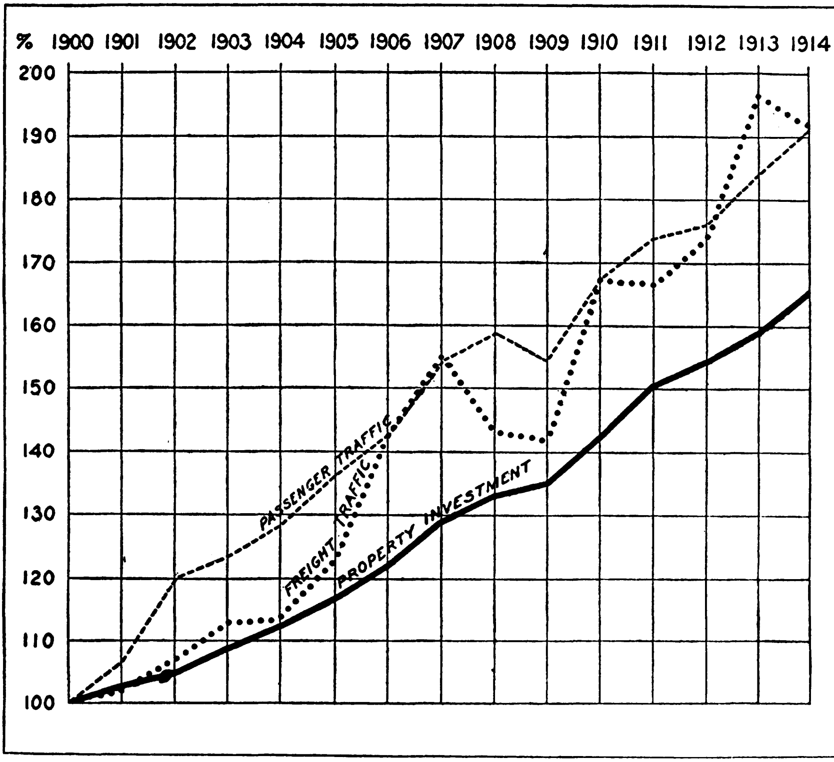
cess of freight above the maximum capacity of the roads, but also a partial paralysis of the entire system and a general reduction of efficiency in handling business. No one cause is sufficiently conspicuous to suggest an effective remedy by reinforcement or improvement of the existing system. At times, car shortage is the predominating symptom, at other times it is motive power that is inadequate, and most frequently, perhaps, terminals and transfers are jammed.

Measures have been taken to bring the existing railway system to its highest efficiency by strengthening the weaker parts of the organism and by developing a highly coördinated management. But such measures are of temporary relief only. Careful observation leads inevitably to the conclusion that the railway mechanism of the country has reached that point in its development where increased capacity and efficiency can be secured only by physical additions amounting to "reduplication"—the construction of an additional operating unit of physical dimensions comparable to that of the present. This would not mean any considerable extension of the railway net, but the duplication of trackage, equipment, and terminals. To this end, railway financiers are endeavoring to raise new capital at the rate of a billion a year and are frankly justifying their purpose by proof of the physical inadequacy of the existing railway establishment.

The strongest proof of this condition of the railways is evidenced by the fact that, in recent years, additional traffic has been handled at an increasing unit cost of service, and the relative increase extends to every important cost factor, *i.e.*, investment, maintenance, and operation. This is the most significant fact of recent railroad history. The railroad business has been considered one of decreasing unit costs, and competitive and developmental rates have customarily been made very low upon the theory of lower costs of additional service. Traffic and revenue statistics submitted by the thirty-five railway systems of the East and Northeast, and substantiated by the investigations of the Interstate Commerce Commission, in the so-called Five Per Cent Rate Case before the Commission in 1914, afford startling evidence of the status of the railways. The statistical charts reproduced in the notes below clearly indicate that the railway establishment of the most highly developed industrial district of the nation has passed the summit of efficiency,

and, since 1906, has experienced a functional decline known in economic parlance as the state of *decreasing returns*, or, conversely, *increasing costs of production.*[22]

CHART G.—*Comparison of increases in property investment and traffic, 1900 to 1914, inclusive, for all 35 systems.*

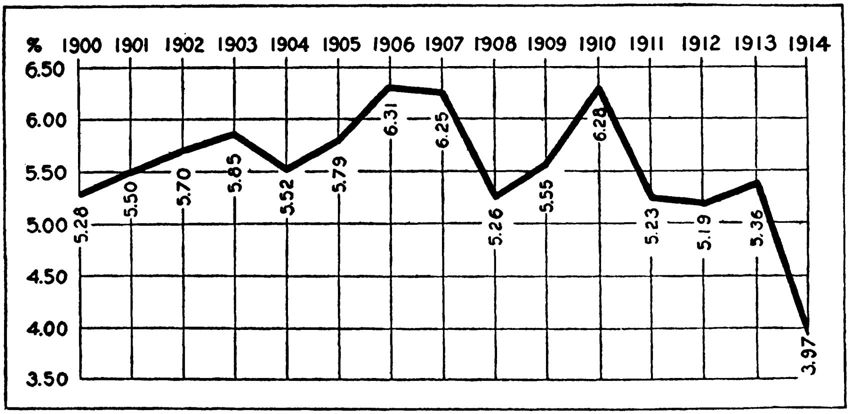


[22] Charts G and H indicate an increasing proportion of traffic growth to investment growth from 1900 to 1907, and, thereafter, a notable decrease in additional traffic and income relative to concurrent investment which is most apparent during 1914.

Chart N effectively illustrates the relative increase of the several items of operating and maintenance expense in contrast with concurrent revenues.

Although correction should be made for increased cost of labor and materials, and possibly for taxes, before such statistics are accepted as evidence of the operation of the *law of decreasing productivity*, the correction is not sufficient to materially modify the character of the revenue and expense ratios, or to invalidate the implications of the chart.

CHART H.—*Ratio of net operating income to property investment for all 35 systems.*

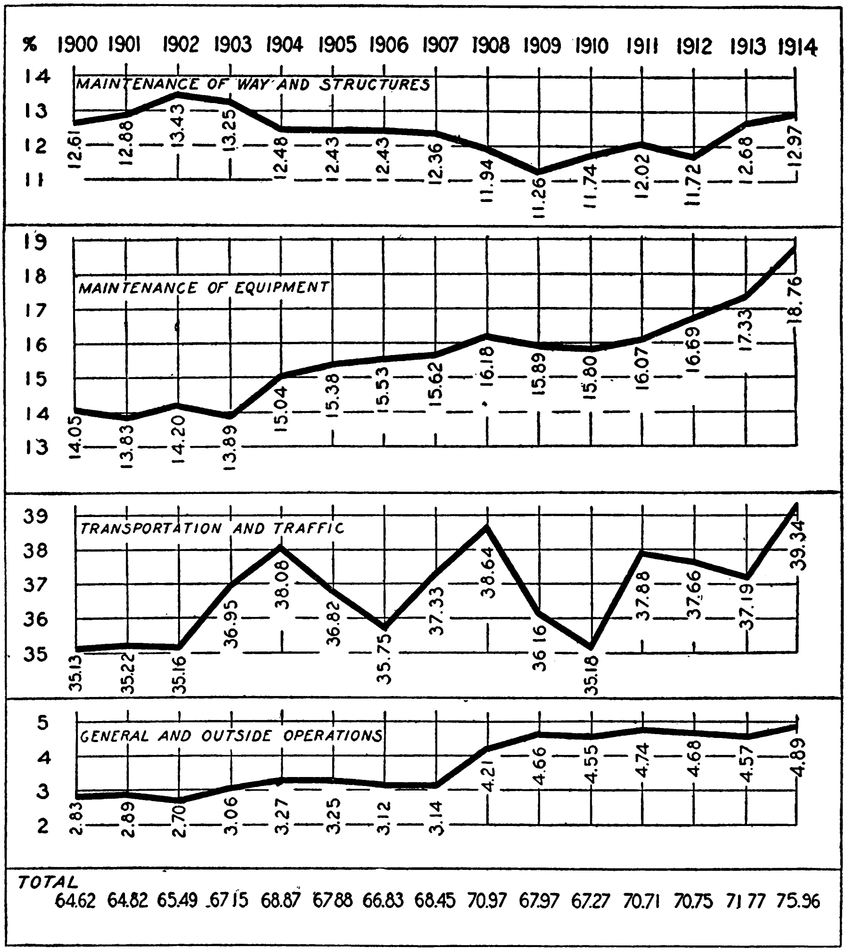


The almost obvious conclusion seems to be that either of two things may be done to provide for the transportation demands of the future. (1) An approximate reduplication of the railway establishment may be undertaken at a probable cost of $20,000,000,000. (2) A system of interior waterways may be developed at a possible cost of $1,000,000,000. Such a waterway would relieve the railways for an indefinite period of a considerable portion of certain classes of bulky traffic which are the primary factors in car shortage and terminal congestion, and would leave the present railway mechanism entirely adequate for the handling of passengers and medium and high class freight.

The physical feasibility of railway enlargement is not a simple matter. Multiplication of tracks is relatively easy, and the same is true of equipment, provided funds are available; but the expansion of terminals presents physical and financial problems which are truly staggering. The terminal problem presents the choice of abandoning terminal properties in the larger cities for more spacious locations or the forcible expansion of city terminals by the clearing of intensively occupied areas of urban land. Electric equipment and underground and overhead passage afford a tremendously costly and, at best, temporary palliative.

Low class freight which may be afforded a reasonable service by water carriage should not longer be permitted to absorb the capacity of railway facilities which are dangerously threatened with

CHART N.—*Ratios of groups of operating expenses to operating revenues for all 35 systems.*



Above charts are reproduced from the findings of the Interstate Commerce Commission *in re* Investigation and Suspension Docket, No. 333, Rate Increases in Official Classification Territory, Dec. 16, 1914.

inadequacy. Fuel, building materials, and some farm crops are admirably adapted to water transport. The annual growth of such traffic is large. It insures a ready demand for water transport and may be desirably eliminated from long-haul rail service.

The development of waterways as a secondary means of transport seems entirely logical. Rivers and canals would cease to be actual or potential competitors of the railways, but would be coördinated with them to form one organic economic unit, the same coöperative devices being used to coördinate rail and water transportation as are now in effect among rail carriers. Adequacy of service and the approximate maintenance of the existing level of transportation rates would be the result, rather than lower rates as prophesied by some visionaries, or the unavoidably higher rates which are rapidly becoming necessary to sustain the higher costs of railway operation.

If, as some contend, railways may be provided to handle all the traffic of the future at rates commensurate with those of the present, the only justification of waterways must be a lower cost for water transport. If this position is correct, the canal and river systems of Europe, rather than being an asset as is generally supposed, are a social impediment, parasitic upon industry and representing a loss of capital equal to all outlays for construction and maintenance plus compound interest on the amount and augmented by a considerable waste during each additional year of operation. But a correct principle of cost determination, as applied to rail and water services, with a proper regard for the respective public and private interests concerned, may give the matter another color.

Transportation is a quasi-public business, with increasing emphasis on the *public* element of the hyphenated adjective. The quality of the service is distinctively a matter of the public interest to be officially determined. The cost of the service is a matter, primarily, of private interest properly to be reflected in rates sufficient to constitute just compensation for capital and labor utilized in creating the service required. The mere magnitude of a business may become so great as to establish a public interest, in addition to service requirements, in such features, for example, as the incidence of the rates and the source and methods of accumulation of capital.

Railway capital is already so great as to absorb a large measure of the total social wealth. The imminent enlargement of the railway plant, in the absence of waterway facilities, will doubtless involve the fixed investment of one-fifth to one-fourth of the nation's capital resources. The segregation of so much capital in any one public service industry of unified management is cause for the exer-

cise of a public interest in the capitalistic features of the transportation business. Now, the railway companies may or may not be able to secure the requisite amount of new capital. In the latter instance, the whole transportation establishment is headed toward government ownership—for government can always raise *funds.* But granting that additional capital may be had, interest charges will become higher on all capital when the new securities are placed. The higher rates will be necessary to attract new capital to the railways, to divert old capital from other enterprises, and to induce saving and investment by persons not sufficiently thrifty to acquire capital at the premium afforded by existing rates of interest.

It is well understood that government can raise capital much easier and cheaper than can the most favorably considered private corporation. Government can borrow at rates one-fourth to one-third lower than can railway companies. Furthermore, funds realized from the sale of government bonds are not withdrawn from industry nor were they, as a rule, available for industrial investment. Government may raise funds by taxation without creating any obligation beyond the employment of such funds in promoting the general welfare. In this it is interesting to observe that the collection of a tax may actually create capital and induce enduring thrift when the interest premium on saving may do neither. It is indeed probable that the large proportion of the total public revenues, approximating $3,000,000,000 annually, represents private savings which would have been thoughtlessly spent for non-essentials in the absence of tax requirements. There is little doubt that the sinking-fund tax levied to retire the Civil War bonds resulted in a net addition to the nation's wealth to the amount of the bonds and interest. The French learned to save while being taxed to pay the German indemnity of 1870 and have been saving ever since. Given a certain standard of well-being, a people may actually be taxed rich, provided public funds thus accumulated are properly disposed—like life-insurance, which involves the identical principle, the benefit may go to the next generation.

We are forced to the conclusion that, if the capital necessary for the absolute requirements of railway enlargement is raised by the ordinary methods of private finance, there will be created a shortage of funds in other businesses, an increased interest rate on capital, and consequent depreciation of all outstanding securities,

and, finally, railway services will be produced at a higher cost and sold to the public at higher rates.

An equal capital could be raised by government without financial proselytism, without disturbing the normal distribution of new capital, without materially advancing the interest rate or disturbing security values, and probably in such a way as to materially increase the private and social wealth of the country. But the investment of public capital raised by bond issue or taxation in railway construction would be a long step toward government ownership, indeed, this fact is the strongest argument in favor of government ownership. In the absence of a desire to accomplish public ownership of railways, it seems the part of wisdom to stabilize and secure private interests as they now are and to utilize the superior financial facilities of the government to supplement the existing rail mechanism of transportation with government-owned waterways subject to regulated use by privately owned boat lines.

The *reasonableness* of water rates may be judged on an entirely different basis than that of rail rates. In the latter instance, private capital requires remuneration on a scale necessary to induce saving and investment as against the ever-present alternative of pleasure-spending. Public capital may be sufficiently compensated in the promotion of economic opportunity or other attributes of general welfare resulting from its employment, regardless of any immediate or direct value return. The primary *interest motive*—the personal reward of saving—is largely absent in matters of public investment; and waterway rates may properly neglect the interest factor in the determination of the cost of the service.

VII. The improvement of navigation as a logical concomitant, or even as a by-product, of power development and flood control is not so remote or inconsequential as may at first appear. The expenditure of large sums in flood prevention on streams of actual or potential navigability is imminent and imperative. Hydro-electric development on a grand scale is a certainty of the next decade or two. The result of both will be a marked improvement in the regimen of many streams subject to navigation. Power development, together with navigation facilities, will tend to a decentralization of industry and population and a redistribution in harmony with economic opportunity as determined by the natural location of the resources and agencies of production.

Railway enlargement means the aggravation and intensification of the social and economic diseases of concentration. Unless new routes and terminals are established, which is improbable, population will continue to concentrate at existing terminals and industrial points along the railway lines. The very nature of railway service and railway rates exerts a constant pressure cityward. Social hygiene may be "far fetched," in the minds of some, when admitted to a discussion of industrial development. To some of the others of us, it is preëminently relevant.

Finally, if there still be reason for doubt as to the financial feasibility of waterway development, let us consider that the customary "pork barrel" appropriations of Congress amount to not less than five per cent annual interest on $500,000,000. The rivers and harbors pork barrel will never be destroyed until the excuse for its existance is disposed of. The application of one-half of that $500,000,000, together with an equal amount to be supplied by the willing localities of the Mississippi Valley, to perfect in detail the Mississippi, Missouri, and Ohio Rivers projects, and the Lakes-to-the-Gulf canal project, would be a beneficent measure, even if the resulting waterways should prove financially unprofitable as means of transportation.